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Manipulating the rural landscape:
Villagisation and income generation in Rwanda

Ann-Sofie Isaksson*

Abstract: The aim of the present paper is to investigate whether households relocated to government-built village settlements, as part of Rwanda's Villagisation programme ('Imidugudu'), diversify into non-farm income-generating activities to a greater extent than other rural households in Rwanda, and if so, to what extent the variation can be explained by differences in micro-level asset and meso-level access factors. Despite the programme objective to stimulate non-farm activity, the results of empirical estimations drawing on household and community-level data suggest that Imidugudu households differ surprisingly little from other rural households in terms of diversification into non-farm income sources. The slightly greater participation in non-farm income-generating activities observed among the Imidugudu households can be attributed to regional variation and household characteristics mattering for selection into the programme rather than to asset endowments and improved service access.

JEL classification: O12, O22, O55
Keywords: Income diversification, livelihoods, villagisation, Rwanda

1 Introduction

In 1996 Rwanda started implementing its highly controversial villagisation policy. Faced with land scarcity and an immediate housing crisis resulting from the destruction and massive population displacements of the civil war and genocide, the villagisation, or *Imidugudu*, policy was initially intended as an emergency housing project. At the time of the implementation, however, it was redefined as an ambitious development programme establishing that *all* households living in scattered rural homesteads – the typical settlement pattern in Rwanda – should be regrouped into organised government/donor constructed village settlements. On top of addressing the immediate housing shortage and the problems of land use, a major ambition was for the policy to help diversify the economy. By settling people in clusters the hope was that markets would develop, stimulating non-farm income-generating activity.

The aim of the present paper is to evaluate whether households that are part of Rwanda's villagisation programme diversify into non-farm income-generating activities to a greater extent than other rural households in Rwanda, and if so, to what extent the variation can be explained by differences in micro-level asset and meso-level access factors. I ask whether Imidugudu households differ from other rural households in terms of asset holdings and access to infrastructure and services and to what extent these factors generate different patterns of income generation. The results of empirical estimations based on household and community-level data suggest that the slightly greater participation in non-farm income-generating activities observed among the Imidugudu households can be attributed to regional variation and household characteristics mattering for selection into the programme rather than to asset endowments and improved service access.

Villagisation attempts in other African countries (e.g. Tanzania and Ethiopia) have negatively impacted agricultural productivity (Daley, 2005; Skarstein, 2005; Thiele, 1986). Peasants being disrupted from their own productive environment, soil degradation around the

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villages and longer walking distances to fields are some of the problems pointed out. In line with this, Kondylis (2007) finds that conflict returnees affected by the Rwandan villagisation policy experience lower agricultural returns. Although agricultural productivity is clearly a very important measure of the economic performance of African rural dwellers, a sizeable literature emphasises the wide variety of ways in which rural households in poor countries make a living (Barrett et al., 2001; Barrett and Reardon, 2000; Bryceson, 1999; Chambers, 1995; Chambers and Conway, 1991). Very few collect all their income from one source, and if focusing on agricultural production alone one fails to capture the complex realities of the life of the rural poor, in particular when focusing on resettling households who have recently moved out of their known productive environment (Chimhowu and Hulme, 2006).

The results of Dercon and Krishnan (1996), who analyse the income portfolios of households in Tanzania and Ethiopia, and of Barrett et al. (2005), who compare diversification strategies among rural dwellers in Rwanda, Kenya and Cote d'Ivoire, point to the importance of household asset endowments and factors related to location and access to credit for households' income-generating strategies. Surprisingly little has been done on diversification and resettlement. Using a mostly qualitative approach, Chimhowu and Hulme (2006) compare the livelihood strategies of planned and spontaneously resettled households in Zimbabwe and find that although the planned resettlers initially improved their conditions, they became vulnerable when the state withdrew their support. In spite of stimulating non-farm activity being one of the explicit objectives of Rwanda's villagisation policy, and even though commentators stress the need for evaluation of this dimension of the programme (UNDG, 2000), no study has evaluated the income-generating strategies of households living in Imidugudu.[1]

Against this background, the focus of the present study is highly relevant from a policy evaluation perspective. Moreover, the fact that the study allows for comparison of two rural groups potentially differing markedly in terms of asset holdings and access to infrastructure and services, and thus with respect to suggested diversification constraints and incentives, makes it theoretically interesting.

2 Diversification: incentives and constraints

Diversification is the norm in rural Africa – few collect all their income from one source (Barrett and Reardon, 2000). Income diversification can be described as the process by which rural households use their livelihood assets to construct a diverse portfolio of activities and social support capabilities in order to survive and improve their standard of living (Carney, 2003; Carney et al., 1999; Chambers and Conway, 1991; Ellis and Freeman, 2004; Scoones, 1998), or as individuals' or households' exchange of assets and their allocation of assets across various activities so as to achieve an optimal balance between expected returns and risk exposure given the constraint they face (Barrett et al., 2001). It is common to classify diversification patterns along sectoral, spatial and/or functional lines, where sectoral classifications refer to income sources coming from the farm or non-farm sector (or alternatively, the primary, secondary or tertiary sector), functional classifications distinguish between wage-employment and self-employment, and spatial classifications refer to local income sources, with the sub-categories on-farm and off-farm, vs. migratory income sources (Barrett and Reardon, 2000).

Non-farm activity in rural Africa is typically positively correlated with income and wealth (Barrett et al., 2001; Barrett et al., 2005), but the causal links involved are not clear-cut. Authors agree that diversification can be born out of desperation or opportunity, and hence can

[1] The section on Rwandan household income diversification in Barrett et al. (2005) is based on data from 1991, i.e. a period before the genocide and the subsequent population displacements.

be for survival as well as for accumulation. As such, diversification incentives include both 'push' and 'pull' factors (Barrett et al., 2001; Barrett and Reardon, 2000; Ellis, 1998; Reardon, 1997; Reardon et al., 2007). Push factors include ex ante risk management, ex post coping with adverse shocks, seasonal income smoothing, responding to diminishing returns to productive assets in a given use, and high transaction costs inducing households to self-provide. Pull factors include higher payoffs or lower risk to the non-farm activity, the realisation of strategic complementarities between activities, and individual specialisation according to comparative advantage. Diversification incentives can be household specific – i.e. can depend on the specific risk and asset profile of the household – or common to a specific region, like relative prices and returns, seasonal variation in production conditions, and factors related to agro-climatic conditions. This micro- and meso-level variation creates important heterogeneity in diversification incentives.

Moreover, there is significant heterogeneity in the *capacity* of households to diversify (Barrett et al., 2001; Barrett et al., 2005; Dercon and Krishnan, 1996; Reardon, 1997; Reardon et al., 2007). Entry into higher return activities often requires substantial investment, i.e. access is limited to an already relatively well endowed group of households and poorer households with meagre asset holdings are left to diversify into lower-return activities. With respect to factors determining the capacity to diversify, focus is usually on capital endowments in a broad sense, capturing both public (meso-level) and private (micro-level) assets (Barrett et al., 2005; Reardon et al., 2007). Assets judged as important for the choice of livelihood strategies include physical capital (basic infrastructure and production equipment), human capital (labour, skills and good health), social capital (networks, memberships of groups etc.), financial capital (savings etc.) and natural capital (e.g. land and livestock) (Bryceson, 1999; Carney et al., 1999; Scoones, 1998). Hence, the assets pointed out as important for the household capacity to diversify refer not only to the stock of resources in individual or household possession, but also to the access to infrastructure that the assets, and the way they can be put to use, depend on. That is, they take account of access to, and benefits derived from, services such as education, health care and roads (Ellis, 1998).

Studies of diversification patterns have tended to focus more on incentive variables and less on capacity determinants (Reardon et al., 2007). The present paper focuses on differences in endowments affecting the capacity to diversify. However, the distinction between variables capturing diversification incentives and capacity is by no means clear-cut. In fact, they are often two sides of the same coin. Lacking an asset could constrain the household from diversifying. Having the same asset in abundance could constitute a diversification incentive. Household land is a good example. Limited land holdings create a push incentive for diversification. At the same time, without land holdings the household might not generate the income needed for investment in non-farm activity or have any collateral for credit etc. Hence, those with the greatest incentive to diversify may be the ones with the most limited capacity to do so. The close connection between diversification constraints and incentives makes it difficult to consider one separate from the other.

As noted, the factors determining the capacity to diversify are often discussed in terms of capital endowments in a broad sense, capturing both public and private assets. In this paper I distinguish between micro-level assets and meso-level access factors, the former relating to household holdings of human, physical, financial and natural capital,[2] and the latter to the

[2] It would have been interesting to consider social capital in this context, but unfortunately there is no satisfactory social capital indicator in the data. However, it has been suggested that disrupting people from their ordinary environments would have negative social capital effects. Kondylis (2007) argues that a lack of integration of Imidugudu dwellers with the rest of the population could result in a 'ghetto effect', and Justino and Vervimp (2008) use the percentage share of cells with Imidugudu in a province as a proxy for its level of social

regional access to relevant services and infrastructures. Although I distinguish between these two sets of factors, they are clearly related. Meso-level access factors should affect the way micro-level assets can be put to use as well as their development over time. Both should, if not evenly distributed, lead to heterogeneity in diversification constraints and incentives.

If living up to its wide-reaching ambitions with respect to infrastructure and service development, the villagisation programme should have the potential to improve meso-level access factors in the short run, and thereby the way micro-level asset endowments can be put to use, as well as how they develop over the longer term. Does this mean that Imidugudu households are, as intended, in a comparatively good position to diversify into non-farm activity? Unfortunately (and as we will see in section 3) this is far from clear; the policy has been heavily criticised for not living up to its stated objectives, and many point specifically to the lack of income-generating activities. Against this background, an evaluation of the comparative micro-level asset and meso-level access status of Imidugudu households, and of whether this shapes their choice of income-generating strategies, is highly relevant.

3 The policy

The Imidugudu policy is founded in the Arusha Accords of 1993, which explicitly state that refugees shall be resettled in sites modelled according to the 'village, grouped type of settlement to encourage the establishment of development centres in the rural area and break with the traditional scattered housing' (Republic of Rwanda, 1993, Article 28). However, while the Arusha Accords specify that the programme should be designed solely for resettling refugees (Republic of Rwanda, 1993, Article 8), according to the villagisation policy of December 1996 *all* rural dwellers should resettle into Imidugudu (Human Rights Watch, 2001). Supported by donors such as the UNHCR and the UNDP, the government embarked on building Imidugudu sites, and by 1999-2000, when the construction of new sites waned off due to lack of donor support, the policy had affected nearly 20 percent of the population (Republic of Rwanda, 2004).

As a background to the policy, several circumstances need mentioning. To begin with, land scarcity coupled with widespread dependence on subsistence agriculture, and conflicts resulting from the pressure on land are features of the Rwandan economy that are relevant to consider in this context. Rwanda is one of the most densely populated countries in Africa. Still, the vast majority of the population reside in rural areas, and rather than living in villages the typical rural settlement pattern is scattered homesteads built close to household fields (Hilhorst and Van Leeuwen, 2000). In addition, over 90 percent of the active population is supported by agriculture (Kairaba, 2002). The resulting pressure on land has been a source of conflict for decades,[3] and has made it increasingly difficult for subsistence farming to provide an adequate livelihood. The consensus view seems to be that reform is necessary (Hoyweghen, 1999; Musahara and Huggins, 2005; UNDAF, 2001; Wyss 2006).

More immediate circumstances relevant for the formulation of the villagisation policy relate to the civil war and genocide, and to the massive population displacements that followed. The period after the genocide saw the return of millions of refugees – including those who had been refused entry into the country for decades (the so-called old caseload, or OCL, refugees), those who fled the country during the genocide (the new case-load, or NCL, refugees), and

capital, arguing that due to the reshuffling of citizens to new settlements a high Imidugudu share can be taken to imply low social capital.

[3] Several studies point to land as a very important factor in the 1994 genocide (see e.g. André and Platteau, 1998; Kairaba, 2002; Musahara and Huggins, 2005; Vervimp, 2004; and Yanagizawa, 2006).

those who had been internally displaced during the same period.[4] The refugee inflows coupled with the destruction of houses and infrastructure during the war and genocide meant that by 1997 Rwanda faced an acute housing crisis. The government response included opening up public lands for resettlement, instructing people to share farmlands and embarking on the widespread villagisation policy (Musahara and Huggins, 2005).

The resettling of refugees and of people living in scattered homes into more concentrated newly built village settlements was meant not only to resolve the immediate housing shortage and address the problem of settlement and land use, but also to promote security and reconciliation, facilitate the provision of basic services and infrastructure, and help improve agricultural productivity. Most relevant for our purposes, an important objective was for the villagisation policy to help diversify the economy. By settling people in clusters, the hope was that markets would develop and that villages would work as rural 'development poles' with opportunities for non-agricultural activity (Global IDP Project, 2005a; Hilhorst and van Leeuwen 2000; IRIN, 2004; PNUD & MINIREISO, 1997; Republic of Rwanda, 2001; Republic of Rwanda, 2004; UNDG, 2000).

With respect to implementation, the central government provided the rules but it was up to local authorities to put the policy into practice. Several authors stress the lack of uniformity in the implementation process (Global IDP Project, 2005a; Hilhorst and van Leeuwen 2000; Human Rights Watch, 2001; Jones, 2000; Pottier, 2006; Republic of Rwanda, 2001; RISD, 1999). The consensus view is that the villagisation policy was implemented hastily and in a rather disorderly manner. It is suggested that the Imidugudu site selection was generally unplanned and determined by the need to resettle refugees and the availability of land for resettlement rather than by guidelines provided by the central government. Similarly, when it comes to the selection of Imidugudu dwellers it is pointed out that no systematic procedures were set to ensure a uniform selection.

The villagisation programme has been extremely contentious. First of all, the policy has been questioned from a democratic and human rights perspective; it was established without any popular consultation and there have been reports of forced relocations and of lack of compensation to people whose land was confiscated for the purpose of building Imidugudu sites. Second, the policy has been criticised for not living up to its stated objectives. The Imidugudu sites have been criticised for not delivering the promised infrastructures and services, for allocating each household too little land and for the new fields being located too far away from homes. Moreover, the government's assumption that villagisation will improve agricultural productivity is contested, and many are sceptical of the claim that villagisation will help diversify the economy and create non-agricultural employment. Instead, commentators point to the lack of income-generating activities and argue that many families in the programme have needed support from friends and relatives to make a living (Global IDP Project, 2005a, 2005b; Hilhorst and van Leeuwen, 2000; Human Rights Watch, 2001; IRIN, 2004; Kairaba, 2002; Kleine-Ahlbrandt, 2004; Musahara and Huggins, 2005; PNUD & MINIREISO, 1997; Pottier, 2006; RISD, 1999; van Leeuwen, 2001). In spite of these criticisms, and while the construction of new sites has waned off, the Government remains committed to the goal that all rural dwellers should resettle into Imidugudu (Republic of Rwanda, 2000, 2002a, 2004, 2007).

While the programme objective to create rural markets with improved service access and infrastructure provision suggests that Imidugudu could help create incentives for and relieve constraints on household diversification into non-farm income-generating activities, the serious criticisms expressed above point to the great need for an evaluation of the same. In the next section I discuss how to approach this issue empirically.

[4] For an in-depth account of Rwandan displacement patterns, and of the history of the OCL and NCL refugee groups, see Global IDP project (2005a,b).

4 Empirical strategy

The aim of the present paper is to evaluate whether households that are part of Rwanda's villagisation programme diversify into non-farm income-generating activities to a greater extent than other rural households, and if so, whether this development is driven by differences in micro-level asset and meso-level access factors. To this end I exploit geographic variation in the speed of implementation of the villagisation policy, comparing households living in Imidugudu settlements with households not yet reached by the programme.

I use cross-section data from Rwanda's 2005/06 EICV2 (*Enquete Intégrale sur le Conditions de Vie des Ménages*) household survey, giving a benchmark sample of 5279 rural households. I complement this data with a community survey, covering the 440 rural clusters (administrative units) surveyed in the 2005/06 EICV2, and the 439 clusters covered in the earlier round of the EICV survey (EICV1 2000/01).

After having evaluated province, cluster and household-level selection into Imidugudu, I focus on the comparative status of Imidugudu households in terms of micro-level 'assets' and meso-level 'access'. Here, I am interested both in household assets brought to the Imidugudu, and in assets acquired and infrastructure access granted while in the Imidugudu. I will then move on to evaluate whether Imidugudu households differ from other rural households in terms of income-generating strategies, and to what extent differences in asset and access factors could help explain this potential variation. For this purpose, I run regressions of (1) household income diversification across different income sources and of (2) the choice to participate in the concerned income-generating activities. In the first step, I estimate an OLS of the Herfindahl index of household income concentration:

$$H_i = I_i\alpha + \left(Assets_i\beta + Access_i\delta\right) + \left(Assets_i \cdot I_i\gamma + Access_i \cdot I_i\eta\right) + \left(Selection_i\lambda\right) + \varepsilon_i .$$

That is, the household income concentration (H_i) is taken to depend on the Imidugudu status of the household (I_i), its assets and access variables ($Assets_i$ and $Access_i$), and their interactions with the Imidugudu dummy. Moreover, I include regional fixed effects and controls for household-level variables found to influence selection into Imidugudu ($Selection_i$).

In the next step, I estimate the following benchmark probit model for the probability of household *i* participating in activity *j* (as indicated by the dummy variable AP_i^j):

$$prob\left[AP_i^j = 1\right] = \Phi\left[I_i\alpha^j + \left(Assets_i\beta^j + Access_i\delta^j\right) + \left(Assets_i \cdot I_i\gamma^j + Access_i \cdot I_i\eta^j\right) + \left(Selection_i\lambda^j\right)\right]$$

Hence, the probability of participating in the different activities is taken to depend on the same variables as above, i.e. Imidugudu status, household assets and access variables, their interactions with the Imidugudu dummy, and selection controls. $\Phi(\cdot)$ denotes the standard normal cumulative distribution function. For variable descriptions and summary statistics, see Tables A1-A2.

4.1 Dependent variable

The outcome variables of interest, H_i and AP_i^j, concern the income-generating strategies of households. I classify household income into incomes derived from own farm activity, farm wage work, non-farm independent activity, non-farm wage work, and miscellaneous income sources (transfers, asset rents and sales etc.). See Table A1 for a more detailed description.

To capture household diversification across the concerned income sources I use the Herfindahl index (H_i), measured as the sum of squared income shares. The index ranges from 0-1 and is increasing in concentration, meaning that when all income is derived from one source it takes the value one, and when income is split into equal income shares derived from many sources it approaches zero (maximum diversification). The measure has the appeal of summarising a whole vector of income shares into a single number between zero and one. Also, and unlike simply considering the household's number of income sources, it takes into account the relative size of income shares, judging household income as more diversified if equal shares are derived from two income sources than if, say, 90% of the income is derived from one source and 10% from the other.[5] Considering that 99 percent of the sample households engage in own farm activity (see Table A2), the Herfindahl index should capture diversification into activities other than subsistence farming.

However, while illustrative, an aggregate measure like the Herfindahl index does not reveal what specific income-generating activities households engage in. Considering the heterogeneous process that diversification constitutes, we need more detailed measures to get a picture of the income-generating strategies of Imidugudu households. For this reason, I also consider activity participation (AP_i^j), using dummy variables to indicate whether the household receives income from own farm activity, farm wage work, non-farm independent activity and non-farm wage work, respectively.

4.2 Explanatory variables

The main explanatory variable of interest is a dummy indicating whether the household lives in an Imidugudu settlement. Eighteen percent of the surveyed rural households report to live in Imidugudu. This is in line with government estimates for the country as a whole, suggesting that 'just under' 20 percent of the population have been affected by the policy (Republic of Rwanda, 2004). However, 74 percent of the sample households still live in isolated communities, making it by far the most common type of rural settlement.[6] The remaining explanatory variables fall into three main categories: asset and access variables (and their interactions with the Imidugudu dummy), and controls.

With respect to assets, I focus on physical capital measured in terms of (the log of) the value of the household's agricultural assets, financial capital measured by (the log of) the value of household durables, natural capital measured in terms of the size of land holdings (log hectares) and (the logged value of) livestock holdings, and human capital, for which I consider the abundance of family labour, their level of education and health status. Turning to the access variables, I consider cluster as well as household-level variation in access to roads, water, schools, health centres and market infrastructures and cluster-level variation in access to agricultural extension services, rural development credit and electricity. The cluster-level variables indicate whether the concerned infrastructures exist within the cluster. At the household level, I consider measures of the distance to the concerned infrastructures. To see if there is variation across Imidugudu and non-Imidugudu households in how the micro-level asset and meso-level access factors relate to income-generating strategies, I run estimations including interaction terms between the Imidugudu dummy and the asset and access variables.

In the next section I will discuss factors that possibly matter for selection into Imidugudu, and how to control for these. However, being interested in finding out whether differences in assets and access are what drive the income diversification pattern of Imidugudu households,

[5] For a discussion of the Herfindahl index, see Barrett and Reardon (2000).

[6] The other response categories being 'neighbourhood lot' (0.1%), 'old regrouping' (5.6%), 'unplanned community' (1.5%) and 'other' (0.9%).

we also need to consider other factors affecting the diversification behaviour of households. In particular, we saw in Section 2 that variation in risk and returns constitutes important diversification incentives. Province[7] and cluster fixed effects will help capture regional heterogeneity in these (originating e.g. in differences in micro-climate, closeness to urban centres etc.). Unfortunately, we have no satisfactory data on the household-specific risk profile and risk preference, but to some extent heterogeneity arising from variation in these factors should be captured by general household controls in terms of family composition, conflict returnee status etc. While the data does not allow for causal conclusions about the relationship between assets/access and income-generating activities, we can evaluate Imidugudu and non-Imidugudu patterns of income-generation and how they correlate with their respective asset and access profiles.

4.3 Selection into the programme

It has been suggested that there was no systematic selection of Imidugudu sites and dwellers (RISD, 1999). However, the Imidugudu programme is not a controlled policy experiment and we need to take account of factors that potentially matter for selection into the programme. The strategy to deal with selection relies on controlling for confounding factors at the province, cluster and household level.

Looking at Table 1, considering Imidugudu coverage by province, it is obvious that some regions were more likely than others to be selected into the programme; the share of households reporting to live in Imidugudu ranges from 94 percent in Kibungo to 2 percent in Kibuye. Two factors suggested to be important for the regional prevalence of Imidugudu are the extent to which returnees, in particular OCL returnees who could not reclaim any property, settled in the area thereby creating a need for housing, and whether there was land available for resettlement (Human Rights Watch, 2001; RISD, 1999). We can see that Kibungo and Umutara, the provinces with the highest shares of Imidugudu households, are also the provinces with the highest shares of households being conflict (and OCL) returnees and the lowest population density.[8] In order to capture unobserved regional heterogeneity that might otherwise contaminate our results, subsequent regressions of diversification behaviour will include province fixed effects.

In line with the suggestion that there was no systematic procedure for Imidugudu site selection within regions (RISD, 1999), cluster-level estimations relating whether the cluster has Imidugudu infrastructure to infrastructures available in the cluster before the Imidugudu implementation period[9] (Table 2) seem to suggest that Imidugudu sites were not selected based on pre-existing health centres, schools, water sources or market infrastructures.[10] On the other hand, there is some indication that certain household characteristics are overrepresented in

[7] The province dummies refer to the administrative structure that existed at the onset of the EICV data collection period and according to which Rwanda was divided into 12 (11 rural) provinces. Today, Rwanda is formally divided into the Northern, Eastern, Southern and Western provinces, plus the City of Kigali.

[8] Considering the extent of relocations in Rwanda in the late 1990s the population density in 2003 is not an ideal measure. If instead considering average household landholdings in 1990, the relation based on the nine available observations is not clear.

[9] The variables are based on information about whether the cluster had the concerned infrastructure in 2000/01 and reported *not* to have built this type of infrastructure during the period 1994-2000/01. Hence the variables do not capture potential cases where the infrastructure existed prior to 1994 but not anymore (e.g. due to destruction during the war), or cases where the infrastructure existed before 1994, but still was constructed in the period 94-00/01. The variables should, however, serve as reasonable approximations of infrastructure existing prior to Imidugudu implementation.

[10] The estimation including province dummies provides some evidence that the presence of a road in the cluster increased the probability of building Imidugudu infrastructure, yet the marginal effect is only weakly statistically significant.

clusters with Imidugudu infrastructure (not presented; see the discussion on household-level selection below). We cannot be sure whether cluster variation in household characteristics influenced Imidugudu site selection or if households with certain characteristics were relocated to clusters with Imidugudu infrastructure. Nevertheless, to capture unobserved heterogeneity based in systematic site selection, some regressions of diversification behaviour will include cluster fixed effects.

As noted, it has been suggested that there were no uniform procedures for selection of Imidugudu dwellers. Nevertheless, we should check for household-level characteristics associated with living in Imidugudu. Table 3 presents the results of probit estimations (with and without province fixed effects for the full sample and for returnee and non-returnee subsamples) of the probability of a household living in Imidugudu on a number of household characteristics arguably not endogenous to Imidugudu status.[11] In line with the observation that provinces with a high share of conflict returnees also tend to have higher shares of Imidugudu coverage, being a conflict returnee, and in particular an OCL refugee, is positively related to living in Imidugudu. In the full-sample and non-returnee sample estimations, the household head having completed primary school is associated with a higher probability of living in Imidugudu. Moreover, there is some indication (although only weakly statistically significant) that female-headed households and households with younger household heads are more likely to live in Imidugudu. In subsequent regressions of diversification behaviour I control for these variables.

5 Results

After considering the comparative 'asset' and 'access' status of Imidugudu households, this section moves on to evaluate whether Imidugudu households differ from other rural households in terms of income-generating strategies, and to what extent differences in asset and access factors could help account for this potential variation.

5.1 Comparative asset and access status

With respect to asset holdings, we compare Imidugudu and non-Imidugudu households in terms of physical, financial, natural and human capital. Table 4 presents the results of regressions of the concerned household asset holdings on Imidugudu status, with and without province dummies and controls for the factors found to matter for selection into Imidugudu.

Judging from the unconditional regressions (Panel A), Imidugudu households have greater holdings than other rural households in terms of agricultural assets (restricting the sample to households engaged in farming) and durables (Columns 1-2), land (Columns 4-5) and educated labour (Column 8). On the other hand, they tend to own comparatively little livestock (Column 3) and to a greater extent have experienced recent health problems (Column 9).

As it turns out, however, not many of these associations withstand controls for regional variation and the household characteristics found to matter for selection into Imidugudu (Panel B). Accounting for these variables, Imidugudu households only stand out from other rural

[11] I want to avoid including household characteristics that have been acquired as a result of living in Imidugudu. Conflict returnee status is independent of living in Imidugudu, and the factors relating to family composition should not be influenced by Imidugudu status to any greater extent over the relatively short period between the policy implementation and the data collection. Finally, considering that only around 2 percent of household heads are younger than 25, whether he/she has completed primary school should in the great majority of cases be determined before the move to Imidugudu. In support of this we can note that we get very similar results when using an alternative indicator focusing on the share of household members over the age of 25 who have completed primary school.

households in terms of being better educated and having greater holdings in terms of durables. Although using an alternative education measure here – the share of household members over 25 who have completed primary school rather than a dummy for whether the household head has done so – the education result reflects what we already know from the household-level selection regression (Table 3), i.e. education matters for selection into Imidugudu. However, if instead focusing on the share of household members under 20 who have completed or ever attended primary school (not presented) and conditioning on the selection controls, the age distribution in the household and the education of older household members, Imidugudu households still stand out as getting more education. That Imidugudu households seem to have greater holdings of durable goods could, to the extent that it takes time to build an asset base, be taken to suggest that economically better off households also tend to select into the programme. To see whether this variation in asset status translates into differences in diversification patterns, asset indicators will be incorporated in the regressions of diversification behaviour.

Turning to the comparative infrastructure access of the Imidugudu households, Table 2 suggests no major differences between clusters with and without Imidugudu settlements in terms of infrastructures existing prior to the Imidugudu implementation period. However, while the household asset base may take time to build, household access to services and infrastructures could presumably develop over the shorter term. Considering that an important aim of the Imidugudu programme was to ensure easy access to service infrastructures, which is why resources have presumably been devoted to construct and improve service infrastructures in Imidugudu settlements, we want to consider Imidugudu service access today. Table 5 presents the results of regressions at the cluster and household levels relating service access in 2005/06 to Imidugudu settlements.

Looking at the cluster-level estimations, considering whether the respective service infrastructures exist within the cluster (Columns 1-8), it seems that not much has changed since 1994; out of the infrastructures also considered in Table 2, we can again only observe a positive association between having Imidugudu settlements and having a road leading to the cluster (with Imidugudu clusters being around 7 percentage points more likely to have a road, Panel B, Column 3). In addition, however, Table 5 considers access to agricultural extension services, credit, and electricity (Columns 6-8). And in fact, the estimations suggest that clusters with Imidugudu settlements are around 10 percentage points more likely to provide agricultural extension services and electricity (Panel B, Columns 6 and 8).

The household-level estimations (Columns 9-13) suggest Imidugudu households tend to have a shorter walking distance to all the considered service infrastructures except a protected water source (i.e. to the market, road, primary school and health centre). Controlling for regional variation and the factors found to matter for selection into Imidugudu (Panel B), the shorter distance to the nearest market, road and school remains, with Imidugudu households having to walk for about 5-7 minutes less than other rural households.

In sum, living in Imidugudu is seemingly associated with a somewhat greater access to service infrastructures. Put in relation to the programme objective to improve service access and infrastructure provision, however, the observed differences are arguably relatively modest. To see whether differences in access status affect the comparative diversification pattern of Imidugudu households, the household-level measures of access to service infrastructures will be incorporated in subsequent regressions of diversification behaviour.

5.2 Income generation

5.2.1 Diversification

Turning to the income-generating strategies of households, let us first consider the Herfindahl index, which captures the degree of household income diversification across our five income sources (own farm, farm wage, non-farm independent activity, non-farm wage and miscellaneous). First of all, we can note that in line with the literature suggesting that diversification is the norm in rural Africa, less than 3 percent of households in our rural sample obtain all of their income from one source.

Regressing the Herfindahl index on Imidugudu status, the asset and access variables and selection controls, the results (Table 6) suggest no difference between Imidugudu and non-Imidugudu households in terms of income diversification. On the other hand, there appears to be some variation across Imidugudu and non-Imidugudu households in how the asset and access factors relate to diversification patterns.

Surprisingly few of our asset variables turn out to be significantly related to diversification as measured by the Herfindahl index. As might be expected, the most robust finding is a tendency for more income diversification (less income concentration) in households with a greater number of working-age adults. While Imidugudu households do not stand out in terms of holdings of this human capital asset (see Table 4), the Imidugudu-adult interaction term parameters in Columns 4-5 seem to suggest that the *association* between this asset and diversification is more pronounced among Imidugudu households. The results also provide some indication of more income diversification among households with health problems, presumably reflecting push incentives for diversification – diversification for survival – among households facing negative income shocks.

When it comes to meso-level access factors, the most robust observation is that the longer the distance to the nearest primary school, the more households tend to diversify. One interpretation of this finding could be that when living further away from a school, school-age children become involved in the household's income-generating activities rather than go to school, thereby increasing the spread of household income sources. Moreover, there is some indication that households living far away from a road and water source tend to diversify less. This finding is not surprising; reasonably, households in more remote areas do not to the same extent engage in market transactions, but rather rely on farming for own consumption. What is more surprising is that we do not observe a similar association with respect to market distance, and that the relationship between diversification and distance to the nearest road – judging from the interaction effect in Column 4 – seems driven by Imidugudu households.

As discussed in Section 2, and as suggested by the above results, income diversification constitutes a heterogeneous process where incentives – both push and pull factors – as well as constraints relate to asset and access factors. Against this background it is interesting to explore whether the degree of income diversification, as measured by the Herfindahl index, varies across income groups and, if so, whether Imidugudu and non-Imidugudu households follow the same pattern. Figure 1 considers the Herfindahl index by income decile for the Imidugudu and non-Imidugudu subsamples. While Imidugudu and non-Imidugudu households display similar diversification patterns across the mid-ranges of the income distribution, some differences can be observed at its ends. In the non-Imidugudu subsample, the most evident observation is that households in the poorest decile (decile 1) diversify the least (i.e. they have high scores on the Herfindahl concentration index), seemingly suggesting that the poorest are somehow constrained from entry into certain income-generating activities, e.g. due to lack of key assets such as land. Among Imidugudu households, however, we instead see the least diversification in the 'richest' decile (decile 10), arguably suggesting that Imidugudu households diversify due

to push rather than pull factors, and that the 'richest' households do not have the same need to diversify for survival.

5.2.2 Activity participation

So, Imidugudu households do not stand out in terms of diversification as measured by the Herfindahl index. And although there are some signs of differences in diversification patterns across income groups for Imidugudu and non-Imidugudu households, the variation is relatively modest. As noted, though, an aggregate measure like the Herfindahl index does not reveal what specific income-generating activities households engage in, nor the share of income derived from the respective income sources. Table 7 compares the Imidugudu and non-Imidugudu samples in terms of the mean income shares derived from the different income sources (overall and by income quintile) and of the share of households participating in different activities.

Comparing across income groups, the income share derived from the own farm tends to be largest in the poorest quintile (0.67 in Imidugudu and 0.64 in non-Imidugudu) and smallest in the richest, presumably reflecting limited off-farm earning opportunities among the poorest. The income share from farm wage work is lowest in the richest and poorest quintiles and relatively high in the second and third quintiles. This reflects the often-observed use of low-return farm wage labour to supplement own farm income among the poor. Again, however, the very poorest appear impeded from access. Imidugudu households follow this pattern but have somewhat lower farm wage shares overall. The income share derived from non-farm independent activity increases with income in both subsamples, presumably reflecting a capacity of richer households to diversify into higher return non-farm activities that require initial investments. Although modest differences, compared to non-Imidugudu households, the income shares derived from non-farm independent activity are relatively high in Imidugudu (especially in quintiles 2-3), whereas for farm wage work they were relatively low, perhaps suggesting that farm-wage earning opportunities are lacking in Imidugudu and that poor Imidugudu households instead turn to low return non-farm independent activity. The share of household income derived from non-farm wage work is modest (3-5 percent) in the poorest quintiles, but increases with income (to 10 percent in Imidugudu and to 15 percent in non-Imidugudu).

Considering the average income shares and participation rates (the percentage share of households receiving some income from the income source) for the different income sources, it thus seems as though Imidugudu and non-Imidugudu households differ mainly in terms of the extent to which they derive income from farm wage and non-farm independent activity. On average, Imidugudu households are less involved in farm wage work and more in non-farm independent activity.

To explore this further, Table 8 (Columns 1-4) presents the results of estimations of the probability of deriving some income from own farm activity, farm wage, non-farm independent activity, and non-farm wage work, respectively. In line with the picture we got from Table 7, the unconditional regressions (Panel A) indicate that Imidugudu households are (13 percentage points) more likely than other rural households to engage in non-farm independent activity and (7 percentage points) less likely to be involved in farm wage work. Moreover, they suggest that living in Imidugudu is positively associated with receiving some income from own farm activity. As it turns out, though, these associations do not withstand controlling for the factors found to matter for selection into Imidugudu (Panel B). Allowing the province dummies to pick up regional variation in agro-climatic conditions etc. and controlling for household characteristics overrepresented in the Imidugudu settlements, Imidugudu households are instead found to be (5 percentage points) more likely to engage in non-farm wage activity. Incorporating our asset and access variables into the estimations (Panel C), however, we can no

longer observe this association. Seemingly then, differences in household assets and/or access to service infrastructures can help explain this variation.

While our primary focus is the comparative performance of Imidugudu households, a few observations stand out with respect to the micro-level asset and meso-level access variables. To begin with, there is too little variation in own farm participation (Column 1) – 99 percent of all households are involved – to be able to run this estimation with the concerned set of explanatory variables.

As regards the asset variables, deriving income from farm wage work (Column 2) is positively associated with the household abundance of labour and negatively associated with the size of land holdings. This should reflect the capacity of the household land to support (in terms of food) and absorb (in terms of own farm work) the household labour. Moreover, better educated households and households with greater holdings of durable goods and agricultural assets are less likely to engage in farm-wage labour, presumably reflecting the low returns to this activity. The probability to engage in non-farm business activity (Column 3), on the other hand, is increasing in both labour and land endowments. The latter should reflect that an important part of non-farm business income consists in the value added from processing of agricultural products. This, together with the positive association found between non-farm independent activity and holdings of durables and agricultural assets, illustrates how limited asset endowments can effectively shut out households from non-farm earning opportunities. Moreover, households where a higher share of household members are of working age are found to be less likely to engage in non-farm independent activity, perhaps suggesting that younger household members tend to assist in these activities. The probability to engage in non-farm wage work (Column 4) is, however, positively associated with both the number and the share of working adults, seemingly suggesting that compared to non-farm independent activity, children do not take part in non-farm wage work to the same extent. Moreover, it is interesting to note that whereas non-farm business activity is closely linked to asset holdings in terms of land and agricultural equipment – highlighting the initial capital requirements to be able to engage in agricultural processing – non-farm wage work instead appears tied to human capital assets.

With respect to meso-level service and infrastructure access we can discern surprisingly few correlation patterns. As might be expected, being located close to the nearest market involves a higher probability of being engaged in non-farm wage work. Somewhat surprisingly, however, there is no statistically significant association between market distance and non-farm independent activity. Instead non-farm independent activity is, again somewhat unexpectedly, more common among households living further away from the nearest road. A possible interpretation of this result could be that households in remote areas engage in processing of agricultural produce in order to satisfy their own demand for diversity in consumption, again illustrating the heterogeneous process that diversification constitutes.

The results seem to indicate that most of the variation between Imidugudu and non-Imidugudu households in terms of income-generating activities can be attributed to the factors identified as important for selecting into Imidugudu. However, the asset and access factors might still be relevant when comparing the two groups; our next question to ask is whether there is variation across Imidugudu and non-Imidugudu households in how the micro-level asset and meso-level access factors *relate* to income-generating strategies. Table 9 presents estimations equivalent to those in Table 8, but including interaction terms between the Imidugudu indicator and our asset and access variables (for the sake of brevity, however, only the interaction terms with parameters statistically significant at least at the 5% level are presented, along with their component asset and access variables).

First of all, we can note that the positive association between agricultural assets holdings and non-farm independent activity (Column 3) appears present among non-Imidugudu

households only. An interpretation for this finding could be that in Imidugudu, non-farm independent activity does not to the same extent involve processing of agricultural produce. It also seems that the observed negative association between education and farm wage work is even more pronounced among Imidugudu households. Comparing the magnitude of coefficients, this appears to be driven by Imidugudu households with little education participating to a greater extent than the equivalent households outside Imidugudu. Moreover, the positive association between education and *non-farm* wage work appears to be present only in the non-Imidugudu subsample, seemingly driven by relatively low participation among the educated in Imidugudu.[12] With respect to the access interactions, we can note that with the exception that living far from the nearest road seemingly only involves a lower probability to engage in farm (and to some extent non-farm) wage work among Imidugudu households, service infrastructure access appears to work no different in Imidugudu as compared to other rural areas.

Summing up the results so far, we observed no difference between Imidugudu and non-Imidugudu households in terms of income diversification as measured by the Herfindahl index. On the other hand, running estimations focusing on the probability of participating in the specific income-generating activities, Imidugudu households at first sight stand out as more likely than other rural households to engage in non-farm independent activity and as less likely to be involved in farm wage work. As it turns out, however, these differences do not withstand controlling for regional variation and household factors found to matter for selection into Imidugudu. However, what we did find in some instances was variation across Imidugudu and non-Imidugudu households in how the asset and access factors relate to overall diversification and the specific income-generating strategies. The next section explores the robustness of these findings.

5.2.3 Robustness checks

First of all, could the lack of a statistically significant difference between Imidugudu and non-Imidugudu households in terms of income diversification as measured by the Herfindahl index be due to non-linearities masking the relationship between Imidugudu and diversification? Seemingly, no; using quantile regression to test whether living in Imidugudu settlements affects the tails (the 10th, 25th, 75th and 90th percentiles) rather than the mean of the Herfindahl index gives the same result.

Turning to the individual income-generating activities, when focusing on own farm activity, farm wage work, non-farm independent activity and non-farm wage work (Tables 8-9, Columns 1-4), the results suggest little variation between Imidugudu and non-Imidugudu

[12] We cannot rule out that it is the association between living in Imidugudu and engaging in the activity that varies with asset status, rather than the relationship between the asset holding and the activity that varies across the Imidugudu and non-Imidugudu subsamples. Some split sample estimations (not presented), however, seem to support the latter. Running separate estimations for the Imidugudu and non-Imidugudu subsamples (thereby allowing all effects to vary across the two groups), in the farm wage work estimation the agricultural asset 'effect' is negative and statistically significant in the Imidugudu sub-sample, and in the non-farm independent activity estimation in the non-Imidugudu sub-sample. However, when instead splitting the sample at the median agricultural asset holding, the Imidugudu parameter is not statistically significant in any of the resulting subsamples. Similarly, running separate estimations for the Imidugudu and non-Imidugudu subsamples, the negative education effect on farm wage work is more than twice the size in the Imidugudu sample, whereas when splitting the sample based on whether the households head has completed primary school, the Imidugudu parameter is not statistically significant in any of the subsamples. Running the equivalent split sample estimations for non-farm wage work, on the other hand, we actually see a positive Imidugudu 'effect' among households with little education (living in Imidugudu implies a 6 percentage point higher probability of engaging in non-farm wage work).

households once controlling for the factors found to matter for selection into Imidugudu. A major objective of the Imidugudu policy, however, is to develop rural 'development poles' with non-agricultural earning opportunities – no distinction is made between non-farm business and non-farm wage work. Perhaps if we consider non-farm income-generating activities together, rather than separately, we will observe systematic variation between the two groups. Tables 8-9, Columns 5-6, present estimations pooling non-farm independent activity and non-farm wage work.

At first sight, Imidugudu households stand out as relying more on non-farm income-generating activities than do other rural households (Table 8, Panel A); they are about 10 percentage points more likely to derive some income from the concerned non-farm sources (Column 5), and around 3 percentage points more likely to receive at least 25 percent of their income from the same (Column 6). Again, however, the observed differences do not withstand controlling for factors found to matter for selection into Imidugudu (Table 8, Panel B). The modest differences observed between Imidugudu and non-Imidugudu once again seem to lie in varying associations between the income-generating activity and some asset variables. As for non-farm independent activity, when introducing the interaction terms between the Imidugudu indicator and the asset and access variables (Table 9), the observed positive association between agricultural asset holdings and non-farm activity is only present in the non-Imidugudu subsample. In fact, when focusing on receiving at least 25 percent of the household income from non-farm sources (Table 9, Column 6), the interaction effect implies a negative association in the Imidugudu sample.

As noted, we want to control for regional variation in the risks and returns of different income-generating strategies. The activity participation estimations in Table 8 (Panels B-C) included province dummies. If we instead use the 440 cluster dummies we are able to control for more local variation, but at the cost of losing a substantial number of observations when having to drop clusters where the cluster dummy predicts the outcome variable perfectly. However, if nevertheless including the cluster dummies (and clustering the standard errors) the results remain largely the same. With the exception of farm wage employment, which now remains negatively related to living in Imidugudu settlements when including the asset, access and selection controls, Imidugudu households still do not stand out in terms of the extent to which they engage in the concerned income-generating activities.

Another potential concern is that parameter heterogeneity across different subsamples masks the relationship between income-generating strategies and living in Imidugudu settlements. In particular, the conflict returnees – who are overrepresented in the Imidugudu villages – might have distinct experiences (displacement, lack of social connections etc.) that separate them from other households. In alternative estimations I therefore split the sample by conflict returnee status and run separate estimations for the two subsamples (thus comparing returnees living in Imidugudu to returnees not living in Imidugudu, and non-returnees in Imidugudu to non-returnees outside Imidugudu). Once including selection controls, Imidugudu households still do not stand out in terms of diversification or in terms of the extent to which they engage in non-farm activity. If in a similar fashion splitting the sample between OCL and non-OCL households, female- and male-headed households and households with educated and non-educated household heads (other group affiliations found to matter for selection into Imidugudu), this result remains unchanged.[13]

[13] Comparing across the around 250 OCL refugee households, living in Imidugudu settlements is, if anything, negatively related with non-farm activity.

6 Conclusions

In 1996 Rwanda implemented a villagisation, or 'Imidugudu' policy, establishing that all households in scattered rural homesteads – the typical settlement pattern in Rwanda – should be regrouped into organised government/donor constructed villages. Around the turn of the millennium, almost 20 percent of Rwanda's population had been resettled into Imidugudu villages. A major goal with the policy was to help diversify the economy. By settling people in clusters, the hope was that markets would develop, stimulating non-farm income-generating activity. As of yet, there has not been a comprehensive evaluation of the income-generating opportunities in the Imidugudu villages.

Against this background, the aim of the present study was to evaluate whether households that are part of Rwanda's villagisation programme diversify into non-farm income-generating activities to a greater extent than other rural households in Rwanda, and to what extent differences in asset holdings and access to infrastructure and services can help explain the potential variation. The empirical findings are based on household- and community-level data, and exploit the geographic variation in the speed of implementation of the Imidugudu programme.

First, we considered the comparative asset and access status of Imidugudu households. With respect to the former, the results suggested that Imidugudu households stand out in terms of being better educated and having greater holdings in terms of durables goods. Regardless of whether this is due to households with greater asset endowments selecting into Imidugudu or assets being acquired while living in Imidugudu (for education, the results indicate that both forces are at play), this should imply that Imidugudu households are comparatively well-equipped to engage in non-farm activity, which is often suggested to involve investments of both financial and human capital. With respect to service/infrastructure access, the results suggest that living in Imidugudu is associated with a somewhat greater access to services and infrastructures such as markets, roads, schools, electricity and agricultural extension services. Although the observed differences are relatively modest in light of the programme objective to improve service access and infrastructure provision, this should nevertheless imply that Imidugudu households are comparatively well-suited to diversify into non-farm activities requiring, say, processing of agricultural produce and functioning markets for exchange.

Given their comparative asset and access status, one would thus expect Imidugudu households to diversify into non-farm income-generating activities to a greater extent than other rural households. This is not what the empirical results reveal, however. We observed no difference between Imidugudu and non-Imidugudu households in terms of income diversification as measured by the Herfindahl index. To gain more insight into the specific income-generating activities engaged in, we turned to estimations focusing on the probability of participating in the concerned activities. At first sight, Imidugudu households stand out as more likely than other rural households to engage in non-farm business activity and as less likely to be involved in farm wage work. As it turns out, however, rather than being explained by the theoretically motivated asset and access factors, these differences do not withstand controlling for regional variation and household factors found to matter for selection into Imidugudu. The finding that Imidugudu households, in spite of the programme objective to stimulate diversification into non-farm activity, do not stand out in terms of their income-generating activities is robust over a wide range of alternative specifications and subsamples.

What we did find in some instances, however, was variation across Imidugudu and non-Imidugudu households in how the asset and access factors *relate* to income-generating strategies. This could be taken to indicate differences across the two groups in terms of who diversifies and why. For instance, the fact that among Imidugudu households we did not to the same extent observe a positive association between education and non-farm wage work, or

between agricultural asset holdings and non-farm independent activity, seems to suggest that in Imidugudu poorer households engage in non-farm income-generating activities to a comparatively great extent. Adding to this picture, whereas in non-Imidugudu we saw the least diversification among the poorest, in Imidugudu we instead observed the least diversification among the 'richest'. While finding similar overall levels of diversification across Imidugudu and non-Imidugudu households, one would thus be inclined to argue that the diversification that takes place in Imidugudu to a greater extent tends to be for 'survival' rather than for 'accumulation'.

On a general level, the results of the present study demonstrate the heterogeneous process that diversification into non-farm income-generating activities constitutes, with incentives as well as constraints relating to asset and access factors. With respect to the specific case under study, we can note that these factors are not enough to understand the comparative income-generating strategies of Imidugudu households.

We can only speculate as to why Imidugudu households, given their asset and access status, do not rely on non-farm income sources to a greater extent. One possible explanation relates to social capital. While we focused on household asset holdings in terms of physical, human, financial and natural capital, we do not have a proxy for social capital. Resettled households that have recently been disrupted from their known productive environment presumably have comparatively weak access to local networks for production and market exchange. This is likely to constitute an important obstacle to business activity beyond subsistence farming. Social capital should develop over time, and likewise, it is reasonable to assume that it takes time for improved service and infrastructure access to affect economic behaviour. A lenient interpretation of the results of the present paper could thus be that change takes time, and that we need to evaluate developments occurring over the longer term. Still though, at the time of the survey, more than five years had passed since the construction of the Imidugudu villages, and in this period the intended rural 'development poles' with sustainable non-farm earning opportunities had clearly failed to materialise.

It is important to note that the Imidugudu policy had several objectives, including to help solve the acute housing shortage and to provide security and reconciliation following the civil war and genocide. Without a counterfactual we cannot claim that the policy should not have been implemented; without the Imidugudu settlements, the housing shortage and conflict over land might well have resulted in continued violence and even more acute poverty. What we can say, however, is that the present study provides very little indication that the programme has achieved its objective of stimulating diversification into non-farm income-generating activities. In more general terms, the results highlight the need to carefully monitor the earning opportunities of resettled households that have been disrupted from their known productive environment.

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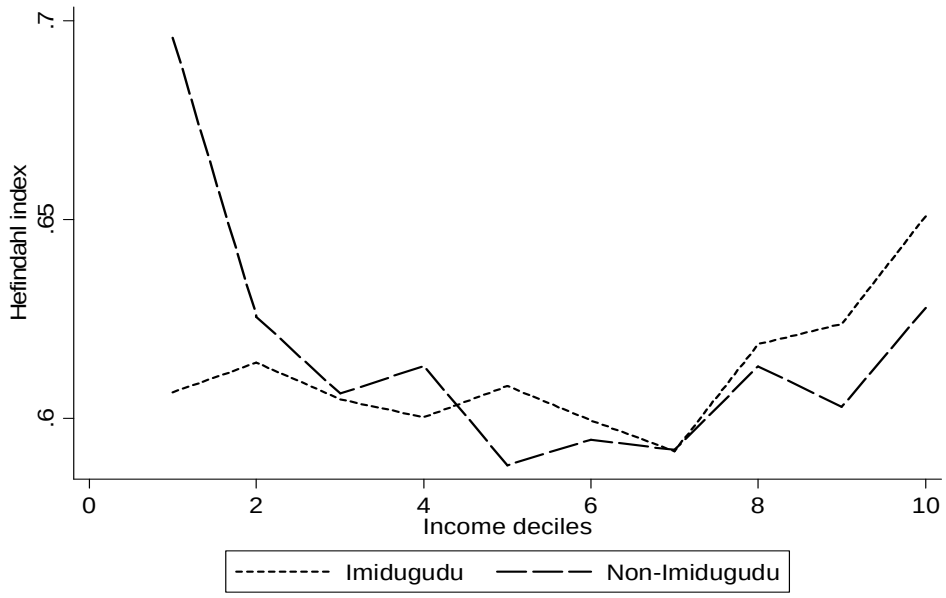
Figures and Tables

Figure 1: Mean Herfindahl index by income decile



Notes: The income deciles are based on a measure of income per adult equivalent (decile 1 is the poorest and decile 10 is the richest). The Herfindahl index is increasing in concentration, meaning that lower values imply a greater degree of income diversification.

Table 1: Imidugudu coverage by province and province characteristics

Province	No. of HH surveyed	% share in Imidugudu	% share returnees	% share of OCL returnees	Pop. density (km^2) in 2003	HH land holdings 1990
Kigali Ngali	480	13	21	6	285	n.a.
Gitarama	480	4	11	2	404	1.02
Butare	479	5	48	4	386	0.84
Gikongoro	480	4	11	2	250	1.03
Cyangugu	480	6	7	1	322	0.67
Kibuye	480	2	13	4	268	1.68
Gisenyi	480	5	29	3	424	0.56
Ruhengeri	480	23	22	2	540	0.96
Byumba	480	3	39	3	421	1.14
Umutara	480	42	57	17	100	n.a.
Kibungo	480	94	58	11	239	1.49
Total rural	5279	18	29	5		

[1]Measures of pop. density in 2003 and average HH landholdings in 1990 are from and Takeuchi and Marara (2007).

Table 2: Probit estimations (marginal effects) of cluster Imidugudu coverage on pre-existing infrastructures

Dependent variable is a dummy for the cluster having Imidugudu infrastructure		
Health centre in cluster before 1994	0.133	0.040
	(0.111)	(0.117)
School in cluster before 1994	0.045	0.126
	(0.069)	(0.078)
Water source in cluster before 1994	-0.073	-0.050
	(0.045)	(0.052)
Road in cluster before 1994	0.040	0.110*
	(0.055)	(0.057)
Market in cluster before 1994	0.012	-0.009
	(0.137)	(0.139)
Province dummies	no	yes
Observations	439	439

Robust SEs in parentheses; * significant at 10%, ** at 5%, *** at 1%; based on EICV 1 data.

Table 3: Probit estimations (marginal effects reported) of Imidugudu status on household characteristics.

Dependent variable is a dummy taking the value 1 if the household lives in Imidugudu						
	Full-sample	Full-sample	Returnees	Returnees	Non-return.	Non-return.
Returnee	0.164***	0.029**				
	(0.014)	(0.013)				
OCL	0.118***	0.079**	0.151***	0.129***		
	(0.029)	(0.032)	(0.034)	(0.044)		
Female HH head	0.005	0.031*	0.014	0.056	0.001	0.021
	(0.016)	(0.017)	(0.035)	(0.042)	(0.017)	(0.016)
Married HH head	-0.021	0.002	-0.030	0.021	-0.017	-0.003
	(0.014)	(0.014)	(0.032)	(0.035)	(0.015)	(0.013)
Age of HH head	-0.001**	-0.000	-0.001	-0.001	-0.001	-0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
HH size	-0.000	0.001	0.001	0.002	-0.001	0.001
	(0.003)	(0.003)	(0.006)	(0.008)	(0.003)	(0.002)
Share in work age	-0.003	-0.018	-0.022	-0.023	0.004	-0.016
	(0.023)	(0.023)	(0.054)	(0.066)	(0.024)	(0.021)
HH head schooling	0.032**	0.041***	0.007	0.009	0.041***	0.046***
	(0.013)	(0.014)	(0.028)	(0.034)	(0.014)	(0.013)
Province dummies	no	yes	no	yes	no	yes
Observations	5275	5275	1519	1519	3757	3757

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: Comparative asset status of Imidugudu households (OLS)

Dependent variable is:	(1) Agr. ass.	(2) Durables	(3) Livestock	(4) Owned land	(5) Land	(6) No. adults	(7) Share adults	(8) Share educ.	(9) Health prob.
Panel A: Unconditional regressions									
Imidugudu	0.180***	0.531***	-0.375**	0.317***	0.320***	-0.004	0.005	0.040***	0.021**
	(0.038)	(0.085)	(0.174)	(0.073)	(0.050)	(0.051)	(0.008)	(0.014)	(0.009)
Constant	0.722***	-1.114***	0.535***	-1.462***	-1.034***	2.645***	0.551***	0.247***	0.217***
	(0.017)	(0.034)	(0.074)	(0.032)	(0.024)	(0.022)	(0.004)	(0.006)	(0.004)
Panel B: Regressions including province dummies and household selection controls									
Imidugudu	0.019	0.334***	-0.085	-0.155	-0.048	-0.009	-0.009	0.063***	-0.001
	(0.055)	(0.110)	(0.248)	(0.112)	(0.076)	(0.071)	(0.012)	(0.019)	(0.012)
Constant	0.640***	-0.671***	0.499*	-2.414***	-1.333***	2.112***	0.659***	0.549***	0.185***
	(0.074)	(0.136)	(0.303)	(0.144)	(0.105)	(0.088)	(0.015)	(0.023)	(0.016)
Observations	5077	5275	5267	5270	5272	5275	5275	4968	5275

Notes: Robust standard errors in parentheses; *significant at 10%, **at 5%, *** at 1%; the HH selection controls refer to the variables found statistically significant in Table 3 (Returnee, OCL, Female HH head, Age of HH head and HH head schooling). In Column 1 the sample is restricted to HH engaged in own farm activity. Column 4 considers only land owned by the household. Column 5 considers the total land utilised by the household (including land that is leased or sharecropped (see Table A1). In Column 8 the HH head schooling control is omitted.

Table 5: Imidugudu service/infrastructure access (Cols.1-8 present Probit marginal effects, cluster-level analysis; Cols. 9-13 OLS coefficients, household-level analysis)

Dep. var. is:	(1) Water	(2) Market	(3) Road	(4) School	(5) HC	(6) Agr. Ext.	(7) Credit	(8) Electricity	(9) Water dist.	(10) Market dist.	(11) Road dist.	(12) School dist.	(13) HC dist.
Panel A: Unconditional regressions													
Imidugudu	-0.076	0.042	0.084***	-0.006	0.009	0.057	-0.030	0.078**	0.115***	-0.177***	-0.272***	-0.075***	-0.122***
	(0.049)	(0.036)	(0.023)	(0.047)	(0.027)	(0.049)	(0.048)	(0.031)	(0.027)	(0.027)	(0.019)	(0.015)	(0.044)
Constant									0.381***	1.126***	0.437***	0.492***	1.232***
									(0.008)	(0.012)	(0.012)	(0.011)	(0.012)
Panel B: Regressions including province dummies (Columns 1-8), or province dummies and household selection controls (Columns 9-13)													
Imidugudu	0.017	0.029	0.065**	-0.034	-0.003	0.096*	0.005	0.107***	-0.004	-0.114***	-0.103***	-0.087***	-0.086
	(0.058)	(0.042)	(0.029)	(0.055)	(0.029)	(0.057)	(0.059)	(0.037)	(0.025)	(0.037)	(0.027)	(0.016)	(0.081)
Constant									0.398***	1.118***	0.191***	0.571***	1.184***
									(0.021)	(0.035)	(0.015)	(0.019)	(0.058)
Obs.	439	439	438	439	439	439	439	437	5275	5275	5275	5275	5275

Notes: Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; in Columns 1-8 the dependent variables are dummies taking the value one if the concerned service infrastructure exist in the cluster, and the Imidugudu indicator is a cluster-level dummy. In Columns 9-13 the dependent variables are self-reported service distance, measured in hours it takes to walk to the nearest service, and the Imidugudu indicator is a household-level dummy. The HH selection controls refer to the variables found statistically significant in Table 3 (Returnee, OCL, Female HH head, Age of HH head and HH head schooling). The estimations in Panels A and B contain the same number of observations, except in Panel B, Column 3, where the observations in the provinces Gitarama and Kibungo are dropped because they predict the outcome variable perfectly, leaving us with 359 observations, and in Panel B, Column 8, where for the same reason the observations in Buyumba are dropped, leaving us with 397 observations.

Table 6: Household income diversification as measured by the Herfindahl index (OLS estimation)

Dependent variable is the Herfindahl index of household income shares (increasing in concentration)

	(1)	(2)	(3)	(4)	(5)
Imidugudu	-0.002	-0.003	-0.002	0.019	0.026
	(0.007)	(0.010)	(0.010)	(0.029)	(0.034)
Asset variables					
Agricultural assets			0.006*	0.004	0.001
			(0.004)	(0.004)	(0.004)
Durables			0.001	0.000	0.001
			(0.002)	(0.002)	(0.002)
Livestock			0.002	0.003	0.001
			(0.002)	(0.002)	(0.002)
Land			-0.000	-0.000	0.003
			(0.003)	(0.003)	(0.004)
No. work adults			-0.016***	-0.013***	-0.013***
			(0.002)	(0.003)	(0.003)
Share work adults			0.006	-0.004	-0.005
			(0.014)	(0.015)	(0.017)
Share health prob.			-0.024**	-0.020*	-0.020
			(0.011)	(0.012)	(0.014)
HH head schooling			-0.003	-0.005	-0.007
			(0.006)	(0.007)	(0.008)
Access variables					
Water distance			0.008**	0.009**	0.007
			(0.003)	(0.004)	(0.006)
Market distance			0.004	0.003	0.001
			(0.004)	(0.004)	(0.006)
Road distance			0.008**	0.006	0.005
			(0.004)	(0.004)	(0.005)
School distance			-0.009***	-0.010***	-0.012***
			(0.002)	(0.002)	(0.003)
HC distance			0.001	0.003	0.000
			(0.003)	(0.004)	(0.006)
Interaction terms[1]					
Imi*Adult				-0.014**	-0.013**
				(0.006)	(0.006)
Imi*Roaddist.				0.037***	0.012
				(0.014)	(0.017)
Constant	0.615***	0.553***	0.568***	0.565***	0.644***
	(0.003)	(0.012)	(0.017)	(0.018)	(0.018)
Selection controls[2]	no	yes	yes	yes	yes
Province dummies	no	yes	yes	yes	no
Cluster dummies	no	no	no	no	yes
Observations	4923	4920	4901	4844	4844
R-squared	0.00	0.03	0.06	0.05	0.17

Notes: Standard errors in parentheses (Cols. 1-4 robust SEs, and in Col. 5 SEs clustered by the 440 survey 'clusters'); *significant at 10%, **significant at 5%, ***significant at 1%; [1]Refer to interaction terms between the Imidugudu dummy and the respective asset and access variables. Due to lack of space only interaction terms with parameters statistically significant at least at the 5% level are presented. [2]The selection controls refer to the variables found statistically significant in Table 3 (Returnee, OCL, Female HH head, Age of HH head and HH head schooling). Column 2 includes the education variable as part of the selection controls. To control for a possible effect of the transformation made of the logged agricultural assets, durables, livestock and land variables (see Table A1), Estimations 3-5 also include dummy variables to control for having zero endowments of these assets.

Table 7: Mean income shares and activity rates

	Full sample						
	Income shares						Participation
	Q1	Q2	Q3	Q4	Q5	AIS	Rates (%)
Own farm	0.64	0.57	0.56	0.57	0.52	0.57	99
Farm wage	0.14	0.20	0.18	0.11	0.06	0.14	38
Non-farm independent	0.04	0.09	0.10	0.14	0.18	0.11	69
Non-farm wage	0.03	0.05	0.08	0.09	0.14	0.08	21
Miscellaneous	0.15	0.09	0.08	0.09	0.10	0.10	84
	Imidugudu subsample						
	Income shares						Participation
	Q1	Q2	Q3	Q4	Q5	AIS	Rates (%)
Own farm	0.67	0.58	0.57	0.58	0.55	0.58	99
Farm wage	0.10	0.18	0.14	0.10	0.05	0.11	32
Non-farm independent	0.05	0.12	0.13	0.14	0.20	0.14	79
Non-farm wage	0.05	0.03	0.08	0.10	0.10	0.08	22
Miscellaneous	0.13	0.09	0.08	0.08	0.10	0.09	83
	Non-Imidugudu sub-sample						
	Income shares						Participation
	Q1	Q2	Q3	Q4	Q5	AIS	Rates (%)
Own farm	0.64	0.57	0.56	0.57	0.51	0.57	99
Farm wage	0.14	0.20	0.19	0.11	0.07	0.14	39
Non-farm independent	0.04	0.08	0.09	0.14	0.18	0.11	67
Non-farm wage	0.03	0.05	0.07	0.09	0.15	0.08	21
Miscellaneous	0.15	0.10	0.09	0.09	0.09	0.10	84

Notes: Q1-Q5 refer to income quintiles based on a measure of income per adult equivalent (quintile 1 is the poorest and quintile 5 is the richest); 'AIS' refers to the average income share derived from the income sources; 'Participation rates' refers to the percentage share of households receiving some non-zero income from the income source.

Table 8: Probit estimations of activity participation (the marginal effects are reported)

Dep. var. is dummy for engaged in:	(1) Own farm activity	(2) Farm wage activity	(3) Non-farm ind. activ.	(4) Non-farm wage activ.	(5) Any non-farm	(6) Non-farm share >25%
Panel A: On Imidugudu status alone						
Imidugudu	0.007**	-0.071***	0.125***	0.004	0.101***	0.028*
	(0.003)	(0.017)	(0.015)	(0.015)	(0.014)	(0.016)
Selection controls	no	no	no	no	no	no
Province dummies	no	no	no	no	no	no
Observations	5154	5269	5236	5261	5219	5278
Panel B: Adding province dummies and HH selection controls						
Imidugudu	0.004	-0.017	-0.008	0.045**	0.014	0.027
	(0.004)	(0.024)	(0.024)	(0.022)	(0.020)	(0.023)
Selection controls	yes	yes	yes	yes	yes	yes
Province dummies	yes	yes	yes	yes	yes	yes
Observations	4688	5266	5233	5258	5216	5275
Panel C: Adding asset and access variables						
Imidugudu	-----	0.003	-0.021	0.031	-0.004	0.002
		(0.025)	(0.024)	(0.021)	(0.021)	(0.023)
Asset variables						
Agricultural assets	-----	-0.032***	0.042***	-0.004	0.022***	-0.010
		(0.010)	(0.009)	(0.007)	(0.008)	(0.008)
Durables	-----	-0.083***	0.037***	0.031***	0.045***	0.060***
		(0.005)	(0.004)	(0.003)	(0.004)	(0.004)
Livestock	-----	-0.002	-0.008*	-0.006*	-0.007*	-0.008*
		(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Land	-----	-0.025***	0.035***	-0.012**	0.022***	-0.016***
		(0.007)	(0.006)	(0.005)	(0.005)	(0.006)
HH no. work adults	-----	0.060***	0.026***	0.033***	0.027***	0.018***
		(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
Share work adults	-----	0.050	-0.135***	0.059**	-0.080***	0.035
		(0.034)	(0.032)	(0.027)	(0.027)	(0.031)
Health prob. share	-----	0.026	0.015	-0.016	0.010	-0.030
		(0.028)	(0.026)	(0.023)	(0.022)	(0.026)
HH head schooling	-----	-0.062***	-0.001	0.044***	0.017	0.040***
		(0.017)	(0.016)	(0.014)	(0.014)	(0.015)
Access variables						
Water distance	-----	-0.015	0.007	-0.001	-0.001	-0.027**
		(0.015)	(0.010)	(0.013)	(0.009)	(0.013)
Market distance	-----	-0.013	-0.007	-0.035***	-0.022***	-0.022**
		(0.010)	(0.009)	(0.008)	(0.008)	(0.009)
Road distance	-----	-0.015	0.025***	-0.000	0.018**	-0.005
		(0.012)	(0.010)	(0.008)	(0.008)	(0.009)
School distance	-----	0.016	-0.003	0.002	-0.005	-0.009
		(0.011)	(0.010)	(0.009)	(0.007)	(0.013)
HC distance	-----	-0.009	0.008	-0.003	0.003	0.005
		(0.008)	(0.008)	(0.006)	(0.007)	(0.007)
Selection controls	------	yes	yes	yes	yes	yes
Province dummies	------	yes	yes	yes	yes	yes
Observations	-----	5244	5211	5236	5194	5253

Notes: Robust standard errors in parentheses. *Statistically significant at 10%, **significant at 5%, ***significant at 1%. In Column 1, Panel C, there is too little variation to run the estimations. The selection controls refer to the variables found statistically significant in Table 3 (Returnee, OCL, Female HH head, Age of HH head and HH head schooling). To control for a possible effect of the transformation made of the logged agricultural assets, durables, livestock and land variables (see Table A1), the estimations in Panel C also include dummy variables to control for having zero endowments of these assets.

Table 9: Probit estimations of activity participation (marginal effects) including interaction terms

Dep. var. is dummy for engaged in:	(1) Own farm activity	(2) Farm wage activity	(3) Non-farm ind. activ.	(4) Non-farm wage activ.	(5) Any non-farm	(6) Non-farm share >25%
Imidugudu	-----	0.118	-0.091	0.062	-0.085	-0.052
		(0.077)	(0.078)	(0.064)	(0.069)	(0.058)
Significant interaction terms						
Imi*Agr.ass.	-----	-0.028	-0.067***	-0.003	-0.050***	-0.042**
		(0.020)	(0.020)	(0.015)	(0.017)	(0.017)
Imi*HHHschool	-----	-0.134***	0.044	-0.069***	0.049	-0.016
		(0.037)	(0.038)	(0.024)	(0.032)	(0.035)
Imi*Roaddist.	-----	-0.081**	0.010	-0.066*	-0.004	-0.039
		(0.041)	(0.030)	(0.036)	(0.025)	(0.037)
Component variables of significant interactions						
Agricultural assets	-----	-0.028**	0.052***	-0.003	0.030***	-0.001
		(0.011)	(0.010)	(0.008)	(0.008)	(0.009)
HH head schooling	-----	-0.038**	-0.008	0.059***	0.008	0.042**
		(0.019)	(0.018)	(0.016)	(0.016)	(0.017)
Road distance	-----	-0.012	0.025**	0.004	0.019**	-0.000
		(0.012)	(0.010)	(0.008)	(0.008)	(0.010)
Selection controls	------	yes	yes	yes	yes	yes
Province dummies	------	yes	yes	yes	yes	yes
Observations		5244	5211	5236	5194	5253

Notes: Robust standard errors in parentheses. *Statistically significant at 10%, **significant at 5%, ***significant at 1%. There is too little variation in own farm activity to run the estimation in Column 1; all estimations include the full set of asset and access variables and their interactions with the Imidugudu dummy. For the sake of brevity, however, only the interaction terms with parameters statistically significant at least at the 5% level are presented, along with their component asset and access variables. The selection controls refer to the variables found statistically significant in Table 3 (Returnee, OCL, Female HH head, Age of HH head and HH head schooling). To control for a possible effect of the transformation made of the logged agricultural assets, durables, livestock and land variables (see Table A1), the estimations also include dummy variables to control for having zero endowments of these assets.

APPENDIX

Table A1: Variable descriptions

Imidugudu variables

Imidugudu: Dummy taking the value 1 if household reports to live in Imidugudu settlement.

Imidugudu infrastructure: Dummy taking the value 1 if the cluster has Imidugudu infrastructure.

Income generation measures

Income: Yearly household income. The sum of the incomes derived from own farm activity, farm wage activity, non-farm independent activity, non-farm wage income, and miscellaneous income sources (see below).

Own farm income: Yearly income from own farm activity including crop sales, the sale of livestock and unprocessed livestock products, revenues from sharecropped fields in household possession, miscellaneous agricultural revenues and the value of retained crop output (there is no information on the value of retained livestock products), deducting expenditures incurred.

Farm wage income: Yearly cash wage from farm wage work, plus possible supplementary in-kind payments.

Non-farm independent income: Yearly income from non-farm independent activity including profits from household enterprises – formal and informal – and value added from processing of agricultural and livestock products.

Non-farm wage income: Yearly wage from non-farm wage work, plus possible supplementary in-kind payments.

Miscellaneous income: Yearly income from asset rents and sales, including the rental and sale of agricultural assets and land as well as from rental of livestock (considering the households may engage in animal rearing, revenues from sale of livestock are included in own farm income), plus 'miscellaneous' income sources such as pensions, social security and transfers from absent household members or other persons.

Activity dummies: dummy variables equal to 1 if the household derives some non-zero income from the concerned income source (own farm activity, farm wage activity, non-farm independent activity, non-farm wage income, respectively). 'Any non-farm' is a dummy equal to 1 if the household derives some non-zero income from either non-farm independent activity or non-farm wage work. 'Non-farm share>25%' is a dummy variable equal to 1 if the household derives at least 25% of its income from non-farm independent activity and non-farm wage work.

Income per adult equivalent: Income / adult equivalents in household. Depending on age and sex you are given a coefficient to proxy for your calorie needs relative to those of a person within the 20-39 years age bracket. Coefficients based on Republic of Rwanda (2002b).

Herfindahl index: The sum of squared income shares: $H = \sum s_i^2$ where *s* represents the shares and *i* the income sources (own farm activity, farm wage activity, non-farm independent activity, non-farm wage income, and misc. incomes).

Asset variables

Agr. Assets: Total value of household's agricultural equipment (quantity owned of each listed equipment times its estimated current value) (in log RwF/1000). In order not to get missing values on observations with zero agricultural assets endowments, I add 0.001 to all observations before taking logs.

Durables: Total value of household durables (in log RwF/1000). In order not to get missing values on observations with zero durable endowments, I add 0.001 to all observations before taking logs.

Value of livestock: Value of household total livestock holdings (no. of livestock units multiplied by their reported values) in (log RwF/1000). In order not to get missing values on observations with zero livestock endowments, I add 0.001 to all observations before taking logs.

Owned land: Land (in log hectares) owned by the household (not including land that is leased or sharecropped). In order not to get missing values on observations with zero land endowments, I add 0.0001 to all observations before taking logs.

Land: Land (in log hectares) utilised by the household (including plots that are owned as well as those that are loaned, leased or sharecropped). In order not to get missing values on observations with zero land endowments, I add 0.0001 to all observations before taking logs.

No. in work age: The number of working age (15-64) adults in the household

Share of working age adults: Share of household members that are of working age (15-64)

Share with health prob.: The share of household members who experienced health problems during the last two weeks.

HH head schooling: Dummy variable taking the value one if the household head has completed primary school.

Access variables, cluster level

Road: Dummy taking the value 1 if there is a road leading to the community.
Water: Dummy taking the value 1 if there is a protected water source (public utility, drilled water well, protected spring water, or free public fountain) in the community.
School: Dummy taking the value 1 if there is a school in the cluster.
HC: Dummy taking the value 1 if there is a health centre in the cluster.
Market: Dummy taking the value 1 if there is a daily or weekly market in the cluster.
Agr. ext.: Dummy taking the value 1 if there is an agricultural extension programme in the cluster.
Credit: Dummy taking the value 1 if the cluster has an agricultural credit institution that offers rural development loans.
Electricity: Dummy taking the value 1 if the cluster has electricity.

Access variables, HH level

Water distance: Time (in hours) it takes to walk to the nearest water source.
Market distance: Time (in hours) it takes to walk to the nearest market.
Road distance: Time (in hours) it takes to walk to the nearest road.
School distance: Time (in hours) it takes to walk to the nearest school.
Health centre distance: Time (in hours) it takes to walk to the nearest health centre.

Selection controls, cluster level

Health centre in cluster before 1994: Dummy taking the value 1 if there was a health centre in the cluster 2000/01 and the cluster did not build health centre infrastructure between 1994 and 2000/01
School in cluster before 1994: Dummy taking the value 1 if there was a school in the cluster 2000/01 and the cluster did not build school infrastructure between 1994 and 2000/01
Water source in cluster before 1994: Dummy taking the value 1 if there was a water source in the cluster 2000/01 and the cluster did not build water source infrastructure between 1994 and 2000/01
Road in cluster before 1994: Dummy taking the value 1 if there was a road in the cluster 2000/01 and the cluster did not build road infrastructure between 1994 and 2000/01

Selection controls, HH level

Conflict returnee: Dummy variable taking the value one if the respondent was displaced due to conflict and returned to the current region of residence between 1994 and 2000.
OCL: Households who are returnees (see criteria above) and whose point of out-migration (proxied by the year the household settled in their current residence minus the time resided in their previous residence) was before 1990.
Female HH head: Dummy taking the value 1 if the head of household is female
Married HH head: Dummy taking the value 1 if the head of household is married.
Age of HH head: The age of the head of household
Share in work age: Share of household members that are of working age (15-64)
HH size: Household size
HH head schooling: (see under asset variables)

Regional controls

Province dummies: 11 rural province dummies for the household being located in Kigali Ngali, Gitarama, Butare, Gikongoro, Cyangugu, Kibuye, Gisenyi, Ruhengeri, Byumba, Umutara and Kibungo, respectively. Kigali Ngali used as benchmark.
Cluster dummies: 440 rural cluster dummies

Interaction terms: Multiplicative terms between the household-level Imidugudu dummy and the respective asset and access variables

Table A2: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Income-generation variables					
Hefindahl	4924	0.62	0.19	0.22	1
Own farm activity	5155	0.99	0.11	0	1
Farm wage activity	5270	0.38	0.48	0	1
Non-farm indep. act.	5237	0.69	0.46	0	1
Non-farm wage act.	5262	0.21	0.41	0	1
Any non-farm	5220	0.75	0.43	0	1
Nonfarm share>25%	5279	0.28	0.45	0	1
Asset variables					
Agr. ass. (logs)	5268	0.69	1.27	-6.91	7.11
Durables (logs)	5279	-1.02	2.28	-6.91	7.95
Livestock (logs)	5271	0.47	4.87	-6.91	10.50
Utilised land (log ha)	5276	-0.98	1.54	-9.21	3.90
No. in work age	5279	2.64	1.44	0	13
Share in work age	5279	0.55	0.24	0	1
Share with health prob.	5279	0.22	0.25	0	1
HH head schooling	5279	0.25	0.43	0	1
Access variables					
Water distance	5279	0.40	0.61	0	24
Market distance	5279	1.09	0.78	0	10
Road distance	5279	0.39	0.74	0	15
School distance	5279	0.48	0.66	0	24
HC distance	5279	1.21	0.91	0	24
Additional selection controls					
Conflict returnee	5277	0.29	0.45	0	1
OCL	5276	0.05	0.21	0	1
Female HH head	5279	0.28	0.45	0	1
Married HH head	5279	0.54	0.50	0	1
Age of HH head	5279	44.81	15.43	15	98
HH size	5279	5.01	2.24	1	16